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Choosing and Using Alternative Refrigerants for Motor Vehicle Air Conditioning

EPA'S OZONE DEPLETION WORLD WIDE WEB SITE: <http://www.epa.gov/ozone/>

Background

Scientists worldwide have concluded that CFC-12 and other chlorofluorocarbons deplete the ozone layer. As a result, over 150 countries have signed a treaty to protect the earth's ozone layer called the Montreal Protocol. In the US, the Protocol is implemented by the Clean Air Act, and regulations issued under the Act ended the production of CFC-12 for air conditioning and refrigeration uses on December 31, 1995.

CFC-12 (also known by the trade name Freon) was widely used in air conditioners for automobiles and trucks for over 30 years. While new vehicles no longer use CFC-12, most vehicles built before 1994 still require its use for servicing. As a result, 30 million cars or more may need conversions to use an alternative refrigerant should the air conditioning develop a leak after CFC-12 is no longer available.

EPA Significant New Alternatives Policy (SNAP)

In 1994, EPA established the SNAP Program to review alternatives to ozone-depleting substances like CFC-12. Under the authority of the 1990 Clean Air Act (CAA), EPA examines new substitutes for their ozone-depleting, global warming, flammability, and toxicity characteristics. EPA has determined that several refrigerants are acceptable for use as CFC-12 replacements in motor vehicle air conditioning systems, subject to certain use conditions. This fact sheet lists the use conditions in detail and provides information about the current crop of refrigerants.

It is important to understand the meaning of "acceptable subject to use conditions." EPA believes such refrigerants, when used in accordance with the conditions, are safer for human health and the environment than CFC-12. This designation does not mean that the refrigerant will work in any specific system, nor does it mean that the refrigerant is perfectly safe regardless of how it is used. Finally, note that EPA does not approve or endorse any one refrigerant that is acceptable subject to use conditions over others also in that category.

Note also that EPA does not test refrigerants. Rather, we review information submitted to us by manufacturers and various independent testing laboratories. Therefore, it is important to discuss any new refrigerant with your auto manufacturer and shop technician before deciding to use it, and in particular to determine what effect using a new refrigerant will have on your warranty. Before choosing a new refrigerant, you should also consider whether it is readily and widely available, and your technician should consider the cost of buying recovery/recycling equipment for that refrigerant. Additional considerations about purchasing CFC-12 substitutes can be found in EPA's fact sheet titled "Questions to Ask Before You Purchase an Alternative Refrigerant."

"Drop-in" refrigerants

Many companies use the term "drop-in" to mean that a substitute refrigerant will perform identically to CFC-12, that no modifications need to be made to the system, and that the alternative can be used alone or mixed with CFC-12. However, EPA believes the term confuses and obscures several important regulatory and technical points. First, charging one refrigerant into a system before extracting the old refrigerant is a violation of the SNAP use conditions and is, therefore, illegal. See the section below on use conditions for more information. Second, several alternatives carry an additional use condition to replace standard hoses with less permeable "barrier" hoses. Third, it is impossible to test a refrigerant in the thousands of air conditioning systems in existence to demonstrate identical performance. In addition, system performance is strongly affected by outside temperature, humidity, driving conditions, etc., and it is impossible to ensure equal performance under all of these conditions. Finally, it is very difficult to guarantee that system components will last as long as they would if CFC-12 were used. For all of these reasons, EPA does not use the term "drop-in" to describe any alternative refrigerant.

Use Conditions

Under the SNAP rule, each new refrigerant must be used in accordance with the conditions listed below. If you choose to use an alternative, make sure the service shop meets these requirements and that it has dedicated recovery/recycling equipment for that refrigerant.

UNIQUE FITTINGS: Each new refrigerant must be used with a unique set of fittings to prevent the accidental mixing of different refrigerants. These fittings are attachment points on the car itself, on all recovery/recycling equipment, on can taps and other charging equipment, and on all refrigerant containers. If the car is being retrofitted, any service fittings not converted to the new refrigerant must be permanently disabled. Unique fittings help protect the consumer by ensuring that only one type of refrigerant is used in each car. They also help protect the purity of the recycled supply of CFC-12, which will mean it will last longer, so fewer retrofits will be necessary nationwide.

LABELS: Whether a car is originally designed to use a new refrigerant or is retrofitted, the technician must apply a detailed label giving specific information about the alternative. The label's color is chosen by the manufacturer to be unique, and it contains:

- the name and address of the technician and the company performing the retrofit;
- the date of the retrofit;
- the trade name, charge amount, and, when applicable, the ASHRAE numerical designation of the refrigerant;
- the type, manufacturer, and amount of lubricant used; and
- if the refrigerant is or contains an ozone-depleting substance, the phrase "ozone depleter"

This label covers up information about the old refrigerant, and provides valuable details on the alternative and how it was used. It also tells the owner who performed the retrofit.

REMOVE ORIGINAL REFRIGERANT: The original CFC-12 must be removed from the system prior to charging with the new refrigerant. This will guarantee that the largest amount of clean CFC-12 is available for use in cars that still need it. As mentioned above, this requirement means that no alternative can be used as a "drop-in."

BARRIER HOSES: HCFC-22, a component in some blends, can seep out through traditional hoses. Therefore, when using these blends, the technician must replace the old hoses with new, less permeable hoses. The table notes this additional requirement where appropriate.

Alternative Refrigerants

The table below summarizes the following information about refrigerants reviewed under EPA's SNAP program for use in motor vehicle air conditioning systems. Note that "air conditioning" means cooling vehicle passenger compartments, not cargo areas, so refrigeration units on trucks and rail cars

are not considered air conditioners.

- Name: Many refrigerants are sold under various names. All known trade names are listed, separated by slashes.
- Status:
 - *acceptable subject to use conditions*: May be used in any car or truck air conditioning system, provided the technician meets the conditions described above. Note that EPA cannot guarantee that any refrigerant will work in a specific system.
 - *unacceptable*: Illegal to use as substitutes for CFC-12 in car or truck air conditioners.
 - *proposed acceptable subject to use conditions*: May be used legally. EPA will accept public comment on these refrigerants and then make a final ruling. There is no formal EPA position until then, and it is inappropriate for advertising to imply that EPA has found the product acceptable.
 - *not submitted*: Illegal to use or sell for use in motor vehicle air conditioning systems.
- Date of ruling: The date either a final rule or a proposed listing was published in the Federal Register. Note that proposed listings are not final and may change because of public comment.
- Manufacturer name and contact phone number: Call for more information on testing, performance, system compatibility, etc.
- Composition: Every refrigerant other than HFC-134a is a blend of several components

For More Information

EPA's Stratospheric Ozone Protection Hotline, at 800-296-1996, distributes numerous fact sheets and brochures. Each of the following explains one issue related to motor vehicle air conditioning and ozone depletion:

- Qs & As on Motor Vehicle Air Conditioning: What Consumers & Service Technicians Want to Know
- The Facts Behind the Phaseout (ozone depletion science)
- Qs & As on HC-12a, OZ-12, and Other Flammable Refrigerants
- Questions to Ask Before You Purchase an Alternative Refrigerant
- Substitute Refrigerants Under SNAP (lists of substitutes for all end-uses)

Most of these are also available, along with a great deal of other information, from EPA's Ozone Depletion World Wide Web site:

- <http://www.epa.gov/ozone/>
The Home Page is the main entry point to the site
- <http://www.epa.gov/ozone/title6/SNAP/snap.html>
SNAP information and fact sheets
- <http://www.epa.gov/ozone/title6/609/609.html>
Fact sheets and information on regulations issued under Section 609 of the Clean Air Act, which deals with automobile air conditioning
- <http://www.epa.gov/ozone/science/science.html>
The science page explains how ozone depletion occurs and dispels several common myths

Motor Vehicle Air Conditioning Substitutes for CFC-12
Reviewed Under EPA's SNAP Program as of October 16, 1996

Name (1)	S t a t u s (2)	Date	Manufacturer	Components / Reason Unacceptable					
				HCFC-22	HCFC-124	HCFC-142b	HFC-134a	Butane (R-600) (3)	Iso-butane (R-600a) (3)
HFC-134a	ASU	3/18/94	Several				100		
FRIGC FR-12	ASU	6/13/95	Intermagetics General 800-555-1442		39		59	2	
Free Zone/ RB-276 (4)	ASU	5/22/96	Freezone 888-373-3066			19	79		
Ikon-12	ASU	5/22/96	Ikon Corp. 601-868-0755	Composition claimed as confidential business information					
R-406A/ GHG/ McCool (5)	ASU	10/16/96	People's Welding 800-382-9006	55		41			4
GHG-X4/ Autofrost/ Chill-It (5)	ASU	10/16/96	People's Welding 800-382-9006	51	28.5	16.5			4
Hot Shot/ Kar Kool (5)	ASU	10/16/96	ICOR 800-357-4062	50	39	9.5			1.5
GHG-HP (5)	ASU	10/16/96	People's Welding 800-382-9006	65		31			4
FREEZE 12	ASU	10/16/96	Technical Chemical 800-527-0885			20	80		
OZ-12	UNA	3/18/94	OZ Technology	Flammable blend of hydrocarbons; insufficient data to demonstrate safety					
R-176	UNA	3/18/94	Arctic Chill	Contains CFC-12, which is inappropriate in a CFC-12 substitute					
HC-12a	UNA	6/13/95	OZ Technology	Flammable blend of hydrocarbons; insufficient data to demonstrate safety					
R-405A	UNA	6/13/95	Greencool	Contains a perfluorocarbon, which has extremely high global warming potential and lifetime					

- (1) R-401A (made by DuPont), R-401B (DuPont), R-409A (Elf Atochem), Care 30 (Calor Gas), Adak-29/Adak-12 (TACIP Int'l), MT-31 (Millenia Tech), and ES-12R (Intervest) have not been submitted for review in motor vehicle air conditioning, and it is therefore illegal to use them in such systems.
- (2) See text for details on legality of use according to status
ASU = acceptable subject to fittings, labeling, and no drop-in use conditions
UNA = unacceptable; illegal for use as a CFC-12 substitute in motor vehicle air conditioners
- (3) Although some blends contain hydrocarbons, all blends that are ASU are nonflammable as blended
- (4) Freezone contains 2% of a lubricant
- (5) HCFC-22 content results in an additional use condition: must be used with barrier hoses